784-887
Second Manual
Rec
5-25-48

HQ-140-X COMMUNICATIONS RECEIVER

TECHNICAL DESCRIPTION &
OPERATING INSTRUCTIONS

HAMMARLUND

THE HAMMARLUND MANUFACTURING CO., INC.
460 West 34th Street : : : : New York 1, N. Y.

ERRATA

For all HQ-140-X receivers No. 299 and below the following change should be made on the schematic diagram, Fig. 7.

The Line running up from R48 is connected to the top instead of the bottom of the S4 switch.

For all HQ-140-X receivers No. 849 and below make the following change:

Resistor R35 is 820K ohms (Hammarlund Part No. 19309-103) instead of 180K ohms on the schematic diagram, Fig. 7, and in the Parts List, page 19.

For all receivers 1099 and below C25 is 4 mmf.

For all receivers No. 1494 and below make the following change:

Item C68 is a ceramic trimmer, NPO, 1.5-7 mmf and carries part number 23059.

HQ-140-X
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In order to receive the full unconditional 90-day warranty against defective material and workmanship in this receiver, the warranty card must be filled out and mailed within two weeks of purchase. Please refer to serial number in correspondence.

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Fig. 1—The HQ-140-X Receiver.

INTRODUCTION

The Hammarlund HQ-140-X is a modern, general purpose, superheterodyne communications receiver designed to maintain high performance characteristics for many years without adjustment. The standard cabinet model has a self-contained stabilized power supply operating from a 50-60 cps, 105-125 volt AC source.

Frequency coverage is continuously tunable from 540 Kc to 31 Mc (555 to 9.7 meters) with adequate selectivity to separate crowded signals. Full use of the receiver's high sensitivity is available for reception of even the weakest stations because of inherently high signal-to-noise ratio and the superior Hammarlund noise limiter. The special patented Hammarlund crystal filter provides extreme selectivity for the high attenuation of closely adjacent interfering signals.

Band spread tuning is available on the four higher frequency ranges, with direct calibration for the 80, 40, 20, 15, and 10 meter amateur bands. Calibration charts for other ranges may be easily made for use with the arbitrary band-spread logging scale.

While this receiver was designed primarily for communications use, good fidelity of music and voice reproduction in both the standard and short wave broadcast bands is provided. Power hum is negligible. Either headphones or loudspeaker may be used. Automatic volume control aids in keeping music and voice reception at the desired level.

When you are interested in receiving telegraph or code signals, you will find that the HQ-140-X incorporates an unusually stable beat frequency oscillator. An "S" Meter enables you to obtain accurate reports on received phone signals while the Send-Receive switch and relay connections permit associated transmitter operation without interference.

Large, comfortable and carefully positioned controls make the HQ-140-X a truly professional-type receiver, the ideal instrument for operating in today's crowded short-wave bands.

INSTALLATION AND OPERATION

Unpack the receiver carefully. Make sure that the fuse, tubes, associated tube shields and pilot lamps are in place. Tubes V4, V5, V6, V8, V9, V10, and V11 are not shielded.

Connect the permanent magnet dynamic speaker to the two terminals marked SPEAKER on the rear of the receiver chassis. For best performance do not place speaker on top of receiver cabinet. The antenna may then be connected as described under ANTENNA.

Basically, all that is necessary to operate a radio receiver are the tuning and volume controls. The additional knobs and switches found on a professional-type receiver such as the HQ-140-X control functions which greatly improve operating performance.

The receiver "ON-OFF" switch is on the AUDIO GAIN control. If you are unfamiliar with the type of power available, check with the local power company before plugging in receiver. Turn on the receiver by advancing the AUDIO GAIN. Check to see that the pilot lamps light and tubes warm up.

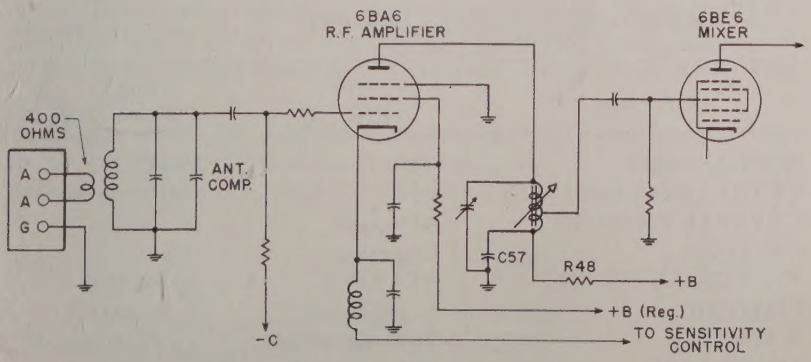


Fig. 2—Tuned RF Amplifier and Mixer.

While the tubes are heating, set the TUNING RANGE switch in the .54-1.32 position, MAN-AVC-BFO on AVC (automatic volume control), CRYSTAL SELECTIVITY on OFF, STANDBY-RECEIVE on RECEIVE, and SENSITIVITY on "10". Tune in the broadcast stations by using the MAIN TUNING dial and AUDIO GAIN control.

For accurate tuning watch the "S" meter. Adjust the MAIN TUNING dial for maximum meter reading for the station to which you are listening.

The ANTENNA compensator knob, the final adjustment, also should be set for greatest meter deflection.

When automatic volume control is not desired, the MAN-AVC-BFO switch can be set on MAN (Manual), the AUDIO GAIN control turned fully clockwise, and the SENSITIVITY control employed to provide the desired volume. When headphones are plugged into the jack in the lower right hand corner of the panel, the speaker is disconnected. On the rear of the chassis are two pin jacks marked RELAY which can be connected to the send-receive relay of the transmitter for break-in operation. With the STANDBY-RECEIVE switch in STANDBY, the receiver is silent but ready for instant use.

The BFO (Beat Frequency Oscillator) control provides a wide choice of tones for CW code operation. Turning the MAN-AVC-BFO switch to BFO disconnects the automatic volume control, and the SENSITIVITY control must then be employed. It is often a great help to use the LIMITER in short wave reception.

The PHASING control normally is set at the arrow in the center of its scale, but may be adjusted to cut out interference from stations on either side of the signal. With the CRYSTAL SELECTIVITY switch the operator can choose the degree of selectivity that provides the greatest fidelity with minimum interference. The first three positions are for phone reception and the fifth and sixth for single signal code reception in extremely crowded bands.

Set controls as follows for initial operation:

CONTROL	*for PHONE*	*for CW or CODE*
MAN-AVC-BFO	AVC	BFO
CRYSTAL SELECTIVITY	OFF	OFF
CRYSTAL PHASING	At Arrow	At Arrow
CW TONE	Inoperative	±2
STANDBY-RECEIVE	RECEIVE	RECEIVE
LIMITER	As required	As required
ANTENNA	To Peak Signal	To Peak Signal
AUDIO GAIN	Adjust	10
SENSITIVITY	10	Adjust

TUNING RANGES

Band	*Frequency*	*Meters Wave Length*
1	.540—1.32 Mc	555 —227
2	1.32—3.2 Mc	227 —93.7
3	3.2 —5.7 Mc	93.7—52.6
4	5.7 —10 Mc	52.6—30.0
5	10 —18 Mc	30.0—16.7
6	18 —31 Mc	16.7—9.7

TUNING PROCEDURE

To tune in a standard broadcast station, it is merely necessary to tune the MAIN TUNING dial to the desired frequency. The BAND SPREAD dial is inoperative on the first two ranges.

For reception of short wave stations with the MAIN TUNING dial only, it is necessary to set the BAND SPREAD dial to 100 in order to attain a calibration accuracy of 1% or better.

The BAND SPREAD dial is calibrated directly for the 80, 40, 20, 15, and 10 meter amateur bands. To make use of this feature, set the MAIN TUNING dial at the high frequency end of the desired amateur band. The BAND SPREAD dial then may be tuned over the range selected. For a higher degree of accuracy the BAND SPREAD dial may be set to the exact frequency of a known signal and the MAIN TUNING dial carefully tuned for maximum signal. It is no longer necessary to touch the MAIN TUNING dial, and the BAND SPREAD calibration will hold.

A 0-100 arbitrary logging scale is also provided for band-spread tuning of any desired ranges which are not directly calibrated. Again the MAIN TUNING dial is set at the high end of the selected range. Turning the BAND SPREAD dial from 100 to 0 tunes the receiver progressively lower in frequency.

The following table indicates the approximate frequency range covered by the BAND SPREAD dial at various settings of the MAIN TUNING dial, for each of the four higher frequency bands of the receiver.

Band	*Low End*	*Middle*	*High End*
3.2—5.7 Mc	0.4 Mc	0.7 Mc	1.25 Mc
5.7— 10 Mc	0.2 Mc	0.5 Mc	0.9 Mc
10 — 18 Mc	0.2 Mc	0.5 Mc	0.9 Mc
18 — 31 Mc	0.6 Mc	1.2 Mc	2.2 Mc

DESIGN

Symbol	*Type*	*Tube Complement*	*Function*
V1	6C4	Triode	Oscillator
V2	6BA6	Remote Cutoff Pentode	RF Amplifier
V3	6BE6	Pentogrid Converter	Mixer
V4	6BA6	Remote Cutoff Pentode	1st IF Amplifier
V5	6BA6	Remote Cutoff Pentode	2nd IF Amplifier
V6	6BA6	Remote Cutoff Pentode	3rd IF Amplifier
V7	6AL5	Twin Diode	Detector, AVC; Noise Limiter
V8	12AU7	Twin Triode	1st AF Amplifier; BFO
V9	6V6GT/G	Beam Power	Audio Power Output
V10	0C3/VR105	Voltage Regulator	Voltage Regulator
V11	5U4G	Full Wave Rectifier	Rectifier

PRE-SELECTION

The antenna input coupling and RF amplifier stage provide the necessary pre-selection and gain for high performance and rejection of undesired signals. The high signal level at the mixer grid, V3, contributes to a favorable signal to noise ratio.

Both grid and plate circuits of the RF stage are tuned; individual tuning coils are selected for each band.

The antenna compensating capacitor, adjustable from the front panel, permits the receiver to be resonated for optimum performance with the antenna in use.

CONVERTER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6), V3, and an independent oscillator (6C4), V1.

The output signal from RF amplifier, V2, is heterodyned with the output of the local high frequency oscillator, V1, and electronically combined within the mixer tube, V3. On the four lower frequency ranges the local oscillator is 455 Kc above the signal frequency. On the two highest ranges the oscillator is 455 Kc below the signal frequency.

Low-loss tube sockets, ceramic band switches, temperature compensating capacitors, zero temperature coefficient ceramic trimmers, and a bi-metallic compensating plate all contribute to oscillator stability. Additional frequency stability is attained by applying regulated voltage to the oscillator plate and by the rugged construction of the entire oscillator section assembly.

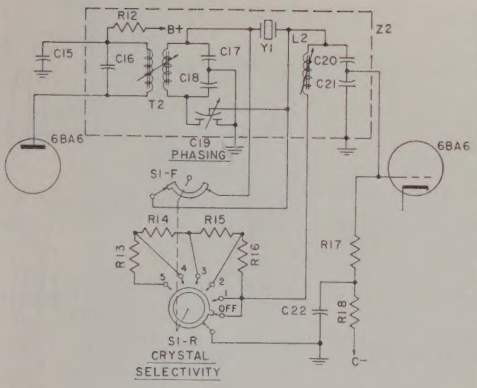


Fig. 3—Crystal Filter Circuit.

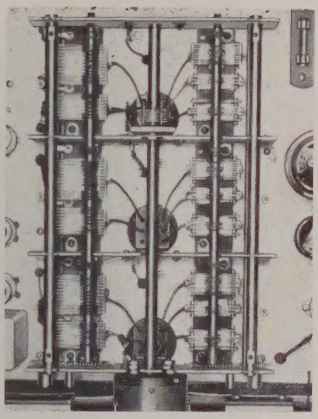


Fig. 4—H. F. Tuning Assembly.

CRYSTAL FILTER AND PHASING NETWORK

The patented Hammarlund 455 Kc crystal filter and phasing network is controlled from the HQ-140-X front panel. Its six-position SELECTIVITY switch includes an OFF position and five increasingly selective bandwidths.

Switch positions 1, 2, and 3 provide progressively sharper crystal selectivity for use in phone reception. Positions 4 and 5, the sharpest selectivity positions, are recommended for reliable CW or code reception. Highest fidelity is obtained in the OFF position, when the crystal filter is inoperative.

The phasing control may be set to highly attenuate interfering adjacent signals. With experienced operating technique the crystal filter offers distinct advantages under severe interference conditions.

IF AMPLIFIER

Nine tuned circuits, in three stages of IF amplification (V4, V5, and V6), contribute to sensitivity and selectivity. The gain per stage is purposely low in order to maintain stability. Iron core permeability-tuned transformers improve performance and add to the ease of adjustment. The intermediate frequency is 455 Kc, the RTMA standard.

AVC SYSTEM

Automatic Volume Control minimizes fading and signal strength variations by controlling the gain of the RF stage V2 and the IF stages V4 and V5. As a result, a comfortable and constant level of audio is maintained.

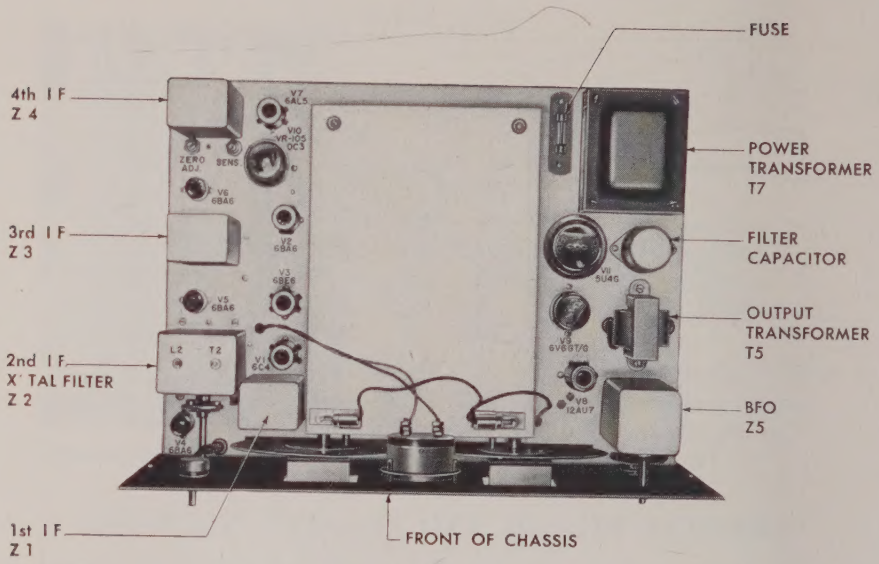


Fig. 5—Top view showing chassis layout.

The Automatic Volume Control is operative only when the MAN-AVC-BFO switch is in the AVC position. With AVC, greatest signal-to-noise ratio will result with the SENSITIVITY control set at maximum. It may be necessary to reduce sensitivity slightly for unusually strong signals.

"S" METER

The "S" or Tuning Meter is provided to assist in tuning and to give an indication of relative signal strength. Because the meter readings are proportional to AVC voltage, it is operative only when the MAN-AVC-BFO switch is in the AVC position.

The meter, which is calibrated to 20 db over S-9, is factory adjusted so that a signal input of approximately 50 microvolts gives a reading of S-9. Each "S" unit indicates a 6 db increase, equivalent to doubling signal strength.

Should meter re-adjustment be necessary:

1. Set front panel SENSITIVITY control to "10" and CRYSTAL SELECTIVITY to "OFF".
2. With receiver off, mechanically zero pointer with a fine screwdriver.

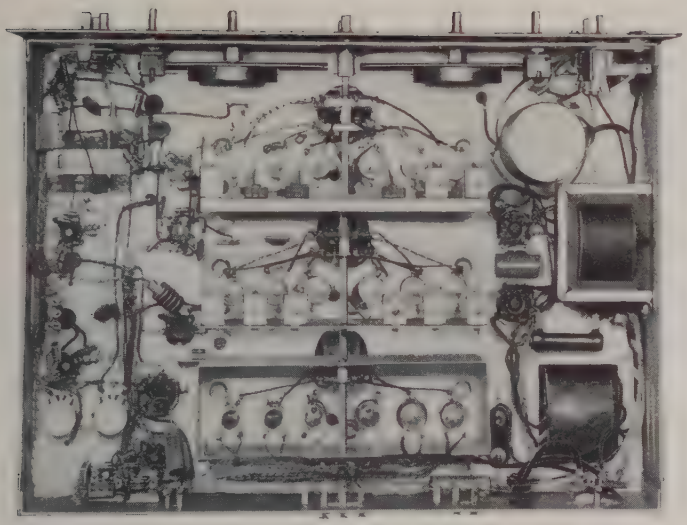


Fig. 6 Bottom view showing placement of parts.

3. With the AVC on and the 1st IF tube V4 removed, zero pointer with ZERO ADJ potentiometer R-19.
4. With AVC on and V4 replaced, adjust meter sensitivity with SENS potentiometer R-23.

SECOND DETECTOR AND NOISE LIMITER

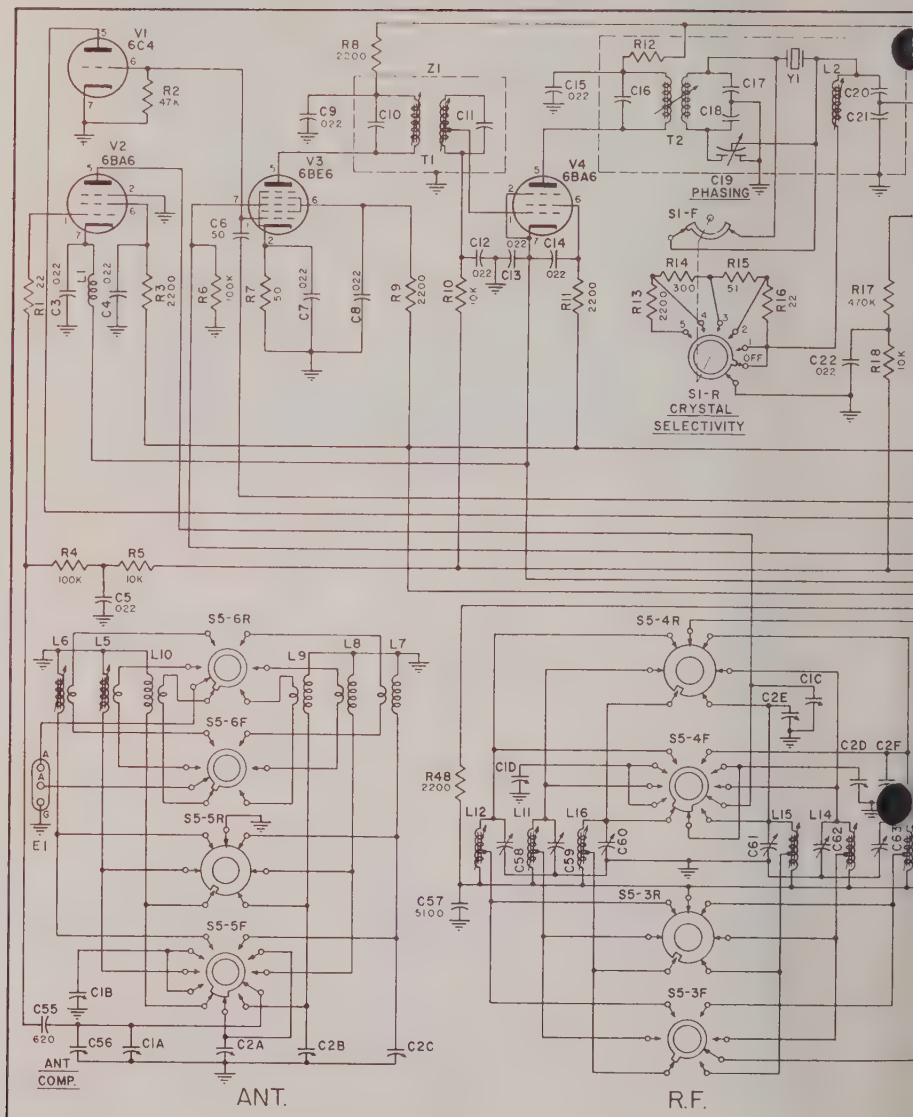
One section of the 6AL5 tube V7 is used for the second detector and AVC system. This system produces a minimum of distortion.

The other half of V7 operates as a series, self adjusting noise limiter. It will reduce automobile ignition and other types of impulse noise to a minimum. Intelligibility is not affected by the noise limiter, although it may be switched off if desired.

BEAT FREQUENCY OSCILLATOR

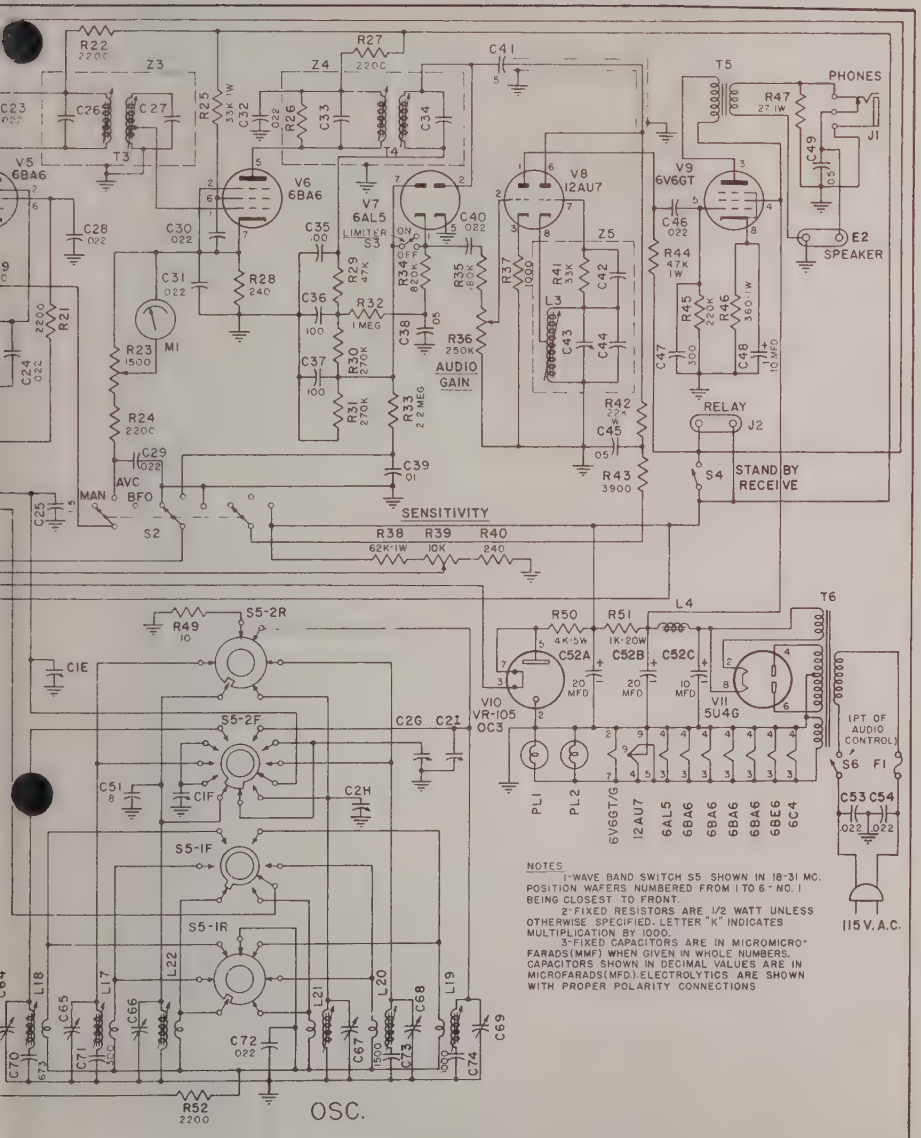
The Beat Frequency Oscillator, which employs one section of the 12AU7 (V8), is designed to provide reception of CW or unmodulated code signals. The CW TONE control permits selection of the desired audio tone. Each calibration division represents approximately 1000 cycles.

The BFO is only operative when the MAN-AVC-BFO switch is in the BFO position.



SCHEMATIC DIAGRAM

Fig. 7—C



NOTES
1-WAVE BAND SWITCH S5 SHOWN IN 18-31 MC. POSITION WAFERS NUMBERED FROM 1 TO 6 - NO. 1 BEING CLOSEST TO FRONT.
2-FIXED RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED. LETTER "K" INDICATES MULTIPLICATION BY 1000.
3-FIXED CAPACITORS ARE IN MICROMICRO-FARADS(MMF) WHEN GIVEN IN WHOLE NUMBERS. CAPACITORS SHOWN IN DECIMAL VALUES ARE IN MICROFARADS(MFD.).ELECTROLYTICS ARE SHOWN WITH PROPER POLARITY CONNECTIONS

THE HQ-140-X RECEIVER

diagram.

AUDIO AMPLIFIER

The first audio stage is a resistance coupled voltage amplifier using the other section of the 12AU 7 (V8). The audio output stage, a 6V6GT/G beam power amplifier (V9) provides an undistorted output of at least 2 watts.

The output transformer impedance is 6 ohms to match the voice coil of the Hammarlund or other suitable permanent magnet speaker. The phone jack is connected across the voice coil winding and silences the speaker when the phone plug is inserted.

POWER SUPPLY

The self-contained, stablized power supply is designed with a large safety factor to insure reliable, trouble-free operation. Humfree performance is provided by a two section filter. High voltage is supplied by the 5U4G rectifier, V11. The OC3 VR105 (V10) furnishes regulated voltage to the variable frequency oscillator V1 and the screen grid of V2, V3, V4, and V5.

ANTENNA

The HQ-140-X is designed for use with either a single wire or balanced type of antenna. A good match to most antenna systems will be obtained because of the receiver's input impedance, nominally 400 ohms, and its high sensitivity.

For general coverage an indoor wire of 20 to 50 feet will give surprisingly good reception. A long single wire outdoor antenna such as shown in Figure 8 will generally give entirely satisfactory performance. This wire may be 50 to 75 feet long.

For best reception the antenna should be isolated as much as possible from neighboring objects.

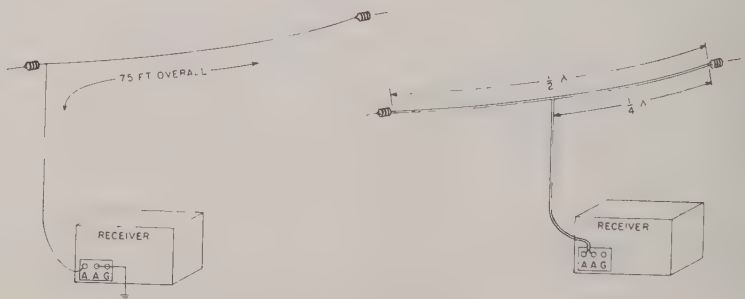


Fig. 8—Antenna suggestions.
(A) Single Wire. (B) 300 ohm folded di-pole.

Optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a half-wave di-pole or folded di-pole fed with 300 ohm or suitable lead-in as shown in Figure 8B.

The length of the required di-pole may be calculated by the following formula:

$$\text{Length (feet)} = \frac{468}{\text{Freq. (Mc)}}$$

A good ground, although not absolutely necessary, will frequently aid in reception.

RE-ALIGNMENT PROCEDURE

A. *Equipment necessary*

1. Cathode-ray oscilloscope (externally synchronized by the signal generator.)
2. Frequency Modulated (swept) signal generator (fairly constant output.)
3. Output Meter.

B. *IF Amplifier*

The intermediate-frequency transformers are iron-core permeability-tuned, and resonated with fixed silver-mica capacitors. A high degree of stability results, which should make IF re-alignment unnecessary for a long time. Re-alignment should not be attempted without suitable equipment.

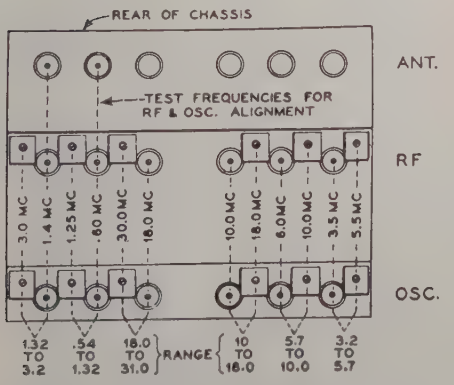


Fig. 9—Left: Diagram for tuning IF Amplifier, RF Stage and H. F. Oscillator.

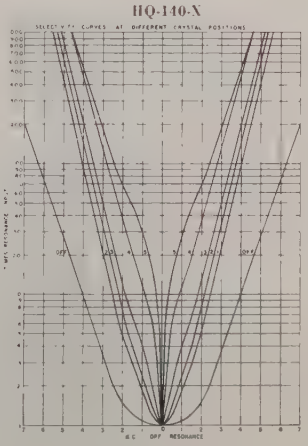


Fig. 10—Selectivity Curves.

The IF transformers must be tuned for symmetry and proper coincidence of the visible curves as well as for amplitude on the oscilloscope. This requires a stage-by-stage alignment, starting with the last IF transformer (Z1) and continuing back through the first IF transformer (Z1).

This is the procedure:

(1) Set receiver as follows:

MAIN TUNING DIAL	.54 Mc
Bandswitch (TUNING RANGE)	.54—1.32 Mc
STANDBY-RECEIVE	RECEIVE
LIMITER	OFF
MAN-AVC-BFO	MAN
CRYSTAL SELECTIVITY	OFF

(2) With the generator set at 455 Kc apply signal to the grid (pin No. 1) of the 3rd IF tube (V6). Adjust the two inductors of Z4 alternately to obtain maximum amplitude, symmetry, and pattern coincidence on the oscilloscope.

(3) Apply the signal input lead to the grid (pin No. 1) of the 2nd IF tube (V5). Turn the two adjustment screws of Z3 to obtain a symmetrical, coinciding curve with as much amplitude as possible without disturbing the pattern.

(4) Switch the signal input lead to the grid (pin No. 1) of the 1st IF tube (V4), and adjust the plate inductor (T2) of the crystal filter (Z2) for maximum amplitude at center of curve.

(5) Apply the signal input to the grid (pin No. 7) of the 6BE6 mixer tube (V3). Adjust screws of 1st IF transtransformer (Z1) as in (3). This should result in a tall selectivity curve with a slightly flattened peak.

(6) Turn CRYSTAL SELECTIVITY switch to position No. 1, set CRYSTAL PHASING pointer on arrow, and adjust the grid inductor (L2) of the crystal filter (Z2) for maximum amplitude and symmetry. Adjust signal input or receiver SENSITIVITY control as required to prevent overloading.

(7) Switch to CRYSTAL SELECTIVITY position No 2, and if necessary, move PHASING CONTROL slightly from arrow to obtain identical images.
Adjust signal generator frequency to obtain coincidence of the images. If complete coincidence is not obtained, alternately make slight adjustments of the PHASING

CONTROL and the signal generator frequency, until images coincide.

After these last steps have determined the exact frequency of the Quartz crystal, the frequency setting of the signal generator should be left undisturbed.

(8) Repeat carefully the complete IF alignment procedure (steps 1 through 7) for the crystal frequency.

C. *RF Amplifier*

The RF and oscillator stages have been carefully aligned against standard crystals at the factory and are designed to hold their adjustments over a long period of time. Re-alignment should not be attempted unless it is positive that re-adjustment is necessary.

As shown on the chart, Figure 9. the front row of adjustments control the H. F. oscillator frequency and consequently dial calibration.

The middle row of adjustments control RF alignment and the rear adjustments are for antenna alignment.

Here is the procedure:

1. Set controls as follows:

Receiver

STANDBY-RECEIVE	RECEIVE
MAN-AVC-BFO	MAN
CRYSTAL SELECTIVITY	OFF
BAND SPREAD	100
Bandswitch (TUNING RANGE)	.54—1.32 Mc
MAIN TUNING	.60 Mc

Signal Generator

Frequency	.60 Mc
Modulation	Off

Each band is adjusted for maximum response by changing the inductance at the low-frequency end and the capacitance at the high-frequency end. These adjustments mutually affect each other. If much change is made at one end of the band, the other end of the band must also be re-adjusted. This procedure is repeated until dial calibration coincides with frequency at both ends of the band.

At 30 Mc there is some interaction between the RF and oscillator sections. It is therefore necessary to rock the MAIN

TUNING dial back and forth while adjusting the trimmer capacitor, in order to avoid a false setting.

2. With signal generator connected to the receiver ANTENNA terminals, and output meter connected to the SPEAKER terminals, adjust L17 until maximum deflection is obtained on the meter.

3. Change signal generator frequency to 1.25 Mc as shown in Figure 9. Set MAIN TUNING dial on 1.25 Mc to correspond. Adjust trimmer capacitor C73 to tune in signal, and C69 for maximum response.

4. Set signal generator to 1.4 Mc, change to the 1.32—3.2 Mc Band, and set MAIN TUNING dial on 1.4 Mc. Adjust L18 until signal appears and L12 and L6 for maximum response.

5. Change signal generator to 3 Mc, and set MAIN TUNING dial to 3 Mc to correspond. Adjust C64 to tune in signal and C58 for maximum response.

In like manner this procedure is followed for each band and should be repeated until calibration and tracking are as desired.

MAINTENANCE

The HQ-140-X is designed to give years of trouble-free service without need for repairs. Tube failure is the most common source of trouble. The second most common cause of difficulty is component failure among small resistors and fixed capacitors.

The following chart, Figure 11, gives voltages between tube socket terminals and chassis. Below each voltage, in parenthesis, is shown the meter scale required for checking with a voltmeter having a sensitivity of 1000 ohms per volt or better. Slight variations from voltages indicated may be disregarded.

With the aid of the chart and the schematic diagram, defective components can usually be located. The parts list in the back of this manual gives values and Hammarlund part numbers.

Standard items may be purchased locally. Non-standard components are available on order from the factory.

A delicate communications receiver should be entrusted only to a qualified technician. Should difficulty be experienced, please write the company for advice or to arrange for factory service.

LINE VOLTAGE 117 V.A.C.	SENSITIVITY AND AUDIO AT MAX., NO SIGNAL Limiter-off Man. Position Receive Position										MAN-AVC-BFO SWITCH POSITION	
											AVC	BFO
	RF 6BA6	Mixer 6BE6	OSC 6C4	1st IF AMP 6BA6	2nd IF AMP 6BA6	3rd IF AMP 6BA6	Det. AVC Limiter 6AL5	Output 6V6GT	Rectifier 5U4G	Volt. Reg. OC3/ VR105	1st Audio ½ 12AU7	BFO ½ 12AU7
Pin 1 to ground.....	...	...	92 (300)	...	...	...	−0.2 (12)	...	...	Tie Point 210 (300)	75 (300)	....
Pin 2 to ground.....	...	1.1 (3)	...	3.5 (6)	1.5 (3)	2.3 (3)	−0.4 (12)	...	298 (300)	...	....	
Pin 3 to ground.....	6.2 A.C.	6.2 A.C.	6.2 A.C.	6.2 A.C.	6.2 A.C.	6.2 A.C.	6.2 A.C.	256 (300)	...	106 (300)	2.3 (3)	
Pin 4 to ground.....	...	...	...	...	...	...	...	273 (300)	280 A.C.	...	6.2 A.C.	
Pin 5 to ground.....	200 (300)	205 (300)	92 (300)	203 (300)	200 (300)	192 (300)	...	...	Tie Point 273 (300)	106 (300)	6.2 A.C.	
Pin 6 to ground.....	100 (300)	92 (300)	...	100 (300)	100 (300)	110 (300)	...	Tie Point 210 (300)	280 A.C.	...	....	75 (300)
Pin 7 to ground.....	3.6 (6)	...	...	3.5 (6)	3.1 (6)	2.3 (3)	−0.2 (12)	6.2 A.C.	...	106 (300)	....	−13 (60)
Pin 8 to ground.....	...	...	...	...	...	...	...	14 (60)	298 (300)			

PARTS LIST HQ-140-X

Schematic Designation	Description	Hammarlund Part No.
	CAPACITORS	
C1, A-F	Main Tuning, variable.....(Part of 20840-G1)	
C2, A-I	Band Spread, variable.....(Part of 20840-G1)	
C3, 4, 5	Ceramic disc, .022μf W.V.D.C.....	23034-24
C6	Silver mica, 50 μμf 500 W.V.D.C.....	23071-5
C7, 8, 9	Ceramic disc, .022 μf W.V.D.C.....	23034-24
C10	Silver mica, 240 μμf 500 W.V.D.C. (Part of Z1, I.F. transformer assembly *26121)..	23071-56
C11	Silver mica, 260 μμf 500 W.V.D.C. (Part of Z1, I.F. transformer assembly *26121)..	23003-112
C12, 13, 14, 15	Ceramic disc, .022 μf W.V.D.C.....	23034-24
C16	Silver mica, 220 μμf 500 W.V.D.C. (Part of Z2, Crystal Filter Assembly *26125).....	23071-55
C17, 18	Silver mica, 100 μμf 500 W.V.D.C. (Part of Z2, Crystal Filter Assembly *26125).....	23003-94
C19	Crystal phasing variable, (Part of Z2, Crystal Filter Assembly *26125).....	11776-G1
C20	Silver mica, 270 μμf 500 W.V.D.C. (Part of Z2, Crystal Filter Assembly *26125).....	23003-104
C21	Silver mica, 100 μμf 500 W.V.D.C..... (Part of Z2, Crystal Filter Assembly *26125).....	23003-94
C22, 23, 24	Ceramic disc, .022 μf W.V.D.C.....	23034-24
C25	Ceramic, NPO 1 5 μμf 500 W.V.D.C.....	23023-107 CK
C26	Silver mica, 240 μμf 500 W.V.D.C. (Part of Z3, I.F. transformer assembly *26123).....	23071-56

PARTS LIST HQ-140-X—Cont.

Schematic Designation	Description	Hammarlund Part No.
	CAPACITORS—Continued	
C27	Silver mica, 260 μμf 500 W.V.D.C. (Part of Z3, I.F. transformer assembly *26123)	23003-112
C28,29,30,31,32	Ceramic disc, .022 μμf W.V.D.C.	23034-24
C33, 34	Silver mica, 95 μμf 500 W.V.D.C. (Part of Z4, Final I.F. transformer assembly *26112)	23071-62
C35, 36, 37	Mica, 100 μμf 500 W.V.D.C.	23001-48
C38	Paper tubular, .05 μf 600 W.V.D.C.	23912-2
C39	Paper tubular, .01 μf 400 W.V.D.C.	23912-23
C40	Ceramic disc, .022 μf W.V.D.C.	23034-24
C41	Silver mica, 5 μμf 500 W.V.D.C.	23002-1
C42	Silver mica, 240 μμf 500 W.V.D.C. (Part of Z5, B.F.O. Assembly *26105)	23071-56
C43	B.F.O. variable, (Part of Z5, B.F.O. Assembly *26105)	11735-G42
C44	Silver mica, 220 μμf 500 W.V.D.C. (Part of Z5, B.F.O. Assembly *26105)	23071-55
C45	Paper tubular, .05 μf 600 W.V.D.C.	23912-2
C46	Ceramic disc, .022 μf W.V.D.C.	23034-24
C47	Mica, 300 μμf 500 W.V.D.C.	23001-75
C48	Electrolytic, 10 μf 150 W.V.D.C.	23073-71
C49	Paper tubular, .05 μf 600 W.V.D.C.	23912-2
C50	Mica, 620 μμf 500 W.V.D.C. (Part of R.F. Unit Assembly *26131)	23005-86
C51	Ceramic, NPO 8 μμf 500 W.V.D.C. (Part of H.F. Oscillator Unit Assembly *26143)	23023-22 CH
C52	Electrolytic, 10-500V, 20-450V, 20-450V	15504-61
C53, 54	Ceramic disc, .022 μf.	23034-24
C55	Mica, 620 μμf, 500 W.V.D.C.	23005-86
C56	Antenna Compensator, variable (Part of Main Tuning Unit *20840-G1)	SA-617
C57	Mica, 5100 μμf 500 W.V.D.C.	23015-16B
C58, 59, 60	Trimmer, mica 3-35 μμf.	16089-2
C61	Trimmer, mica 1.5-9 μμf.	16089-1
C62	Trimmer, mica 3-35 μμf.	16089-2
C63	Trimmer, mica 1.5-9 μμf.	16089-1
C64, 65	Trimmer, mica 3-35 μμf.	16089-2
C66, 67	Trimmer, ceramic NPO 1.5-7 μμf.	23059-1
C68	Trimmer, ceramic NPO 3-12 μμf.	23059-2
C69	Trimmer, mica 1.5-9 μμf.	16089-1
C70	Silver mica 673 μμf 500 W.V.D.C.	23004-2
C71	Silver mica 300 μμf 500 W.V.D.C.	23003-105
C72	Ceramic disc., .022 W.V.D.C.	23034-24
C73	Mica, 1500 μμf 500 W.V.D.C.	23015-20
C74	Mica, 1000 μμf 500 W.V.D.C.	23015-40
F1	Fuse, 2 ampere type 3AG	15928-7
J1	Phone jack	6087
J2	Relay jack	6142
E1	Antenna terminal strip	6088
E2	Speaker terminal strip	3843
	COILS	
L1	R.F. choke (CH-X)	609-G1
L2	Crystal Filter grid coil, (Part of Z2, Crystal Filter Assembly *26125-G1)	31068-G1
L4	Filter choke	26111-1
L5	Antenna coil assembly .54—1.32 mc range	26051-G1
L6	Antenna Coil Assembly 1.32—3.2 mc range	26051-G2
L7	Antenna Coil 3.2—5.7 mc range	6013
L8	Antenna Coil 5.7—10 mc range	6016

PARTS LIST HQ-140-X—Cont.

Schematic Designation	Description	Hammarlund Part No.
	COILS—Continued	
L9	Antenna Coil 10—18 mc range	6019
L10	Antenna Coil 18—31 mc range	6022
L11	R.F. Coil Assembly .54—1.32 mc range	26047-G2
L12	R.F. Coil Assembly 1.32—3.2 mc range	26047-G1
L13	R.F. Coil Assembly 3.2—5.7 mc range	26047-G6
L14	R.F. Coil Assembly 5.7—10 mc range	26047-G5
L15	R.F. Coil Assembly 10—18 mc range	26047-G4
L16	R.F. Coil Assembly 18—31 mc range	26047-G3
L17	H.F. Osc. Coil Assembly .54—1.32 mc range	26030-G2
L18	H.F. Osc. Coil Assembly 1.32—3.2 mc range	26030-G1
L19	H.F. Osc. Coil Assembly 3.2—5.7 mc range	26030-G6
L20	H.F. Osc. Coil Assembly 5.7—10 mc range	26030-G5
L21	H.F. Osc. Coil Assembly 10—18 mc range	26030-G4
L22	H.F. Osc. Coil Assembly 18—31 mc range	26030-G3
M1	Carrier Level ("S") meter	26149-G1
PL1, 2	Pilot Lamp No. 47, 6.3 V., .15 amp	16004-1
	RESISTORS	
R1	22 Ohms ½ W	19309-9
R2	47,000 Ohms, ½ W	19309-89
R3	2,200 Ohms, ½ W	19309-57
R4	100,000 Ohms, ½ W	19309-97
R5	10,000 Ohms, ½ W	19309-73
R6	100,000 Ohms, ½ W	19309-97
R7	150 Ohms, ½ W	19309-259
R8, 9	2,200 Ohms, ½ W	19309-57
R10	10,000 Ohms, ½ W	19309-73
R11	2,200 Ohms, ½ W	19309-57
R12	2,200 Ohms, ½ W. (Part of Z2, Crystal Filter Assembly *26125)	19309-57
R13	2,200 Ohms, ½ W	19309-57
R14	300 Ohms, ½ W	19309-202
R15	51 Ohms, ½ W	19309-193
R16	22 Ohms, ½ W	19309-9
R17	470,000 Ohms, ½ W	19309-113
R18	10,000 Ohms, ½ W	19309-73
R19	Potentiometer, 300 Ohms	15368-1
R20	270 Ohms, ½ W	19309-262
R21, 22	2,200 Ohms, ½ W	19309-57
R23	Potentiometer, 1500 Ohms	15368-2
R24	2,200 Ohms, ½ W	19309-57
R25	33,000 Ohms, 1 W	19310-293
R26	47,000 Ohms, ½ W. (Part of Z4, I.F. Transformer Assembly *26113)	19309-89
R27	2,200 Ohms, ½ W	19309-57
R28	240 Ohms, ½ W	19309-201
R29	47,000 Ohms, ½ W	19309-89
R30, 31	270,000 Ohms, ½ W	19309-107
R32	1 Meg Ohms, ½ W	19309-121
R33	2.2 Meg Ohms, ½ W	19309-129
R34	820,000 Ohms, ½ W	19309-119
R35	180,000 Ohms, ½ W	19309-103
R36	Potentiometer 250,000 Ohms (switch attached)	6095
R37	1,000 Ohms, ½ W	19309-49
R38	62,000 Ohms, 1 W	19310-231
R39	Potentiometer, 10,000 Ohms	15367-1
R40	240 Ohms, ½ W	19309-201
R41	33,000 Ohms, ½ W. (Part of Z5, B.F.O. Assembly *26107)	19309-85

PARTS LIST HQ-140-X—Cont.

Schematic Designation	Description	Hammarlund Part No.
	RESISTORS—Continued	
R42	22,000 Ohms, 1 W	19310-81
R43	3,900 Ohms, ½ W. (Part of B.F.O. Bracket Assembly *26029-G2)	19309-63
R44	47,000 Ohms, 1 W	19310-89
R45	220,000 Ohms, ½ W	19309-105
R46	360 Ohms, 1 W	19310-211
R47	27 Ohms, 1 W	19310-11
R48	2,200 Ohms, ½ W. (Part of R.F. Unit Assembly *26137)	19309-57
R49	10 Ohms, ½ W. (Part of H.F. Osc. Assembly *26143)	19309-1
R50	4,000 Ohms, 5 W	19380-47
R51	1,000 Ohms, 20 W	19435-19
R52	2,200 Ohms, ½ W. (Part of H.F. Osc. Assembly *26143)	19309-57
	SWITCHES	
S1, F, R, S2	Crystal Selectivity Assembly MAN-AVC-BFO	26155-1
S3	Limiter	15864-2
S4	Standby-Receive	15864-2
S5-1F, R	H.F. Osc. plate	6331
S5-2F, R	H.F. Osc. grid	6332
S5-3F, R	Detector grid tap	6064
S5-4F, R	R.F. plate	6063
S5-5F, R	R.F. grid	6063
S5-6F, R	Antenna	6062
S6	Power (Part of R36, Potentiometer *6095)	
	TRANSFORMERS AND IMPEDANCE ASSEMBLIES	
T5	Audio Output Transformer	26110-1
T6	Power Transformer	26109-1
Y	Crystal, 455 Kc	6338-1
Z1	1st I.F. Assembly, includes C10, C11, and T1	26121-G1
Z2	Crystal Filter Assembly (2nd I.F.), includes C16, C17, C18, C19, C20, C21, L2, R12, T2, and Y1	26125-G1
Z3	3rd I.F. Assembly, includes C26, C27, and T3	26123-G1
Z4	Final I.F. Assembly, includes C33, C34, R26, and T4	26112-G1
Z5	B.F.O. Assembly includes C42, C43, C44, L3, and R41	26107-G1

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